Description

LANDSCAPE TILLER

Technical Field

[01] This invention relates generally to an implement of a work machine, and, more particularly, to a landscape tiller of a work machine having a single direct drive motor.

Background

[02] Work machines, such as skid steer loaders, tractors, wheel loaders, or backhoe loaders, or other similar work machines use implements, such as landscape tillers, to cultivate the ground, till the ground, level the ground, or other additional operations. When used to perform these sorts of operations, it is normally helpful to have the landscape tiller balanced. Most landscape tillers use two motors, each being positioned on one end of the tiller to offset the weight of each motor and help balance the tiller. Having two motors increases the cost of the tiller and the potential for malfunction. The use of a single motor large enough to drive the landscape tiller, however, can cause the landscape tiller to be off balance.

[03] One known tiller assembly design is disclosed in U.S. Patent No. 6,467,550 B1 that issued to Firdaus on October 22, 2002. It discloses a tiller assembly including a tine assembly that is rotatably connected to a tiller body. The tiller assembly includes a hydraulic system that is operatively connected to a hydraulic motor that drives the tine assembly. This design has only one hydraulic motor to drive the tine assembly, but due to the weight of the hydraulic motor, the tiller may become off balance and may not till level.

[04] The present disclosure is directed to overcoming one or more of the problems as set forth above.

Summary of the Invention

[05] One embodiment disclosed herein is an implement comprising a housing having a first-side portion and a second-side portion, at least one element having a weight and being attached to the second-side portion of the housing, the weight of the element creating a moment arm, a shaft positioned between the first-side portion and second-side portion of the housing and operably coupled to at least one of the element, and a counterweight attached to the first-side portion of the housing to offset the moment arm created by the weight of the element.

[06] In another embodiment disclosed herein, a method comprises fabricating a housing having a first-side portion and a second-side portion, attaching a motor to the second-side portion of the housing, positioning a shaft between the first-side portion and the second-side portion of the housing and connecting it thereto, operably coupling the motor to the shaft, and attaching a counterweight to the first-side portion of the housing to offset the moment arm created by the weight of the motor.

Brief Description of the Drawings

[07] For a better understanding of the present disclosure, reference may be made to the accompanying drawings in which:

[08] Fig. 1 is a diagrammatic front and side view of a landscape tiller operatively mounted to a skid steer loader;

[09] Fig. 2 is a diagrammatic view of the underside of the landscape tiller;

[10] Fig. 2a is a diagrammatic view of a side portion of the landscape tiller; and

[11] Fig. 3 is a diagrammatic side view of the side portion of the landscape tiller.

Detailed Description

[12] Referring to the drawings, depicted in Fig. 1 is an implement, such as a landscape tiller 100, operatively mounted in the conventional manner to a body portion 107 of a work machine 105, such as, but not limited to, a skid steer loader, tractor, wheel loader, or backhoe loader. The work machine 105 includes a hydraulic system 110 including a source of pressurized fluid. The hydraulic system 110 includes a pair of hydraulic fittings 115 adapted to attach, in fluid communication, the landscape tiller 100 with the hydraulic system 110. First and second level indicators 120, 125 are attached at opposite ends of the landscape tiller 100 so that the operator can visually determine the orientation of the landscape tiller 100.

[13] As depicted in Fig. 2, with reference numbers of previous figures being used to identify similar components therein, the landscape tiller 100 includes a tiller mechanism 205 partially enclosed in a housing 210 having a first-side portion 215 and a second-side portion 220. As depicted in Fig. 2a, the housing 210 includes a first aperture 225 in the first-side portion 215 and a second aperture (not shown) in the second-side portion 220.

[14] As further depicted in Fig. 2, the tiller mechanism 205 includes a shaft 245, having a first end 250 and a second end 255. The first end 250 is adjustably and rotatably attached to the first-side portion 215 of the housing 210. The second end 255 is operably attached to a motor 260 (as more specifically described below), which may be a hydraulic motor, a gerotor type motor, an electric motor, a gasoline motor, or other types of motors. The tiller mechanism 205 further includes a plurality of plates 265 attached to the shaft 245 by welding or another suitable process. Removably attached to each plate 265 is a plurality of teeth 270.

[15] As depicted in Fig. 2, the second-side portion 220 of the housing 210 has at least one element attached thereto such that the second-side portion 220 of the housing 210 is heavier than the first-side portion 215 of the housing

210 when nothing is attached thereto, and because of the weight of the at least one element, a moment arm is created. In this embodiment, the element includes the motor 260, but alternatively, may include an additional motor, at least one pump, at least one controller, etc. The housing 201, further, has a first skid 275 and second skid 280 attached thereto, by bolting or another suitable process, to the first-side portion 215 and second-side portion 220, respectively. The first and second skids 275, 280 contact the ground when the landscape tiller 100 is in an operable condition. Mounted above the second skid 280 on the second-side portion 220 of the housing 210 is a motor mount 282. The motor mount 282 is attached by bolting it thereto, or another suitable process. The motor 260 is attached to the motor mount 282 in a conventional manner at the second-side portion 220. The motor 260 includes a splined coupling (not shown) that extends through the second aperture in the second-side portion 220 of the housing 210 and is rotatably attached to the shaft 245 in a conventional manner. A motor-shaft seal (not shown) is attached to the motor 260 so as to protect it against debris entering therein. Additionally, a shaft seal (not shown) located adjacent the motor-shaft seal is attached at the attachment location of the splined coupling of the motor 260 and the shaft 245. Finally, first-end portions 294 of a pair of hydraulic hoses 292 are connected with the motor 260 and second-end portions 295 of the hydraulic hoses 292 are connected with the hydraulic fittings 115 of the hydraulic system 110, as depicted in Fig. 1. When the hydraulic hoses 292 are connected with the motor 260 of the landscape tiller 260 and the hydraulic fittings 115 of the work machine 105, the motor 260 is in fluid communication with the hydraulic system 110.

[16] As depicted in Figs. 2 and 3, with reference numbers of previous figures being used to identify similar components therein, a counterweight 297 is located at the first-side portion 215 of the housing 210 to offset the moment arm created by the weight at the second-side portion 220 of the housing 210, including the weight of the motor 260. The counterweight 297, in this

embodiment, is attached to the first-side portion 215 of the housing 210, but may also be formed integrally with the housing 210. The counterweight 297, of this embodiment, includes a first plate 302 and a second plate 299, each plate having an aperture (not shown). The first plate 302 is placed on an outside 301 of the first-side portion 215 of the housing 210 covering the first aperture 225 and the second plate 299 is placed on an inside 298 of the first-side portion 215 of the housing 210 covering the first aperture 225. The first and second plates 302, 299 are bolted together in compressive engagement with the first-side portion 215 of the housing 210; the compressive forces holding the first and second plates 302, 299 in place.

[17] Finally, the shaft 245 is adjustably and rotatably attached to the first and second plates 302, 299 by extending the first end 250 of the shaft 245 through the apertures in the first and second plates 302, 299 creating a sealed rotatable attachment thereto. Then a plurality of floating bearings 303 are attached to the first end 250 of the shaft 245 and attached to the first plate 302, further rotatably attaching the first end 250 of the shaft 245 to the first and second plates 302, 299. Adjusting the location of the attachment of the counterweight 297 to the first-side portion 215 of the housing 210 permits the shaft 245 to align with the motor 260. In particular, the shape of the first aperture 225 in the housing 210 permits the first and second plates 302, 299 to be adjusted by moving the first and second plates 302, 299 within the first aperture 225 until the floating bearings 303 align with the shaft 245 and the shaft 245 aligns with the motor 260.

Industrial Applicability

[18] Normally, the operator will activate the landscape tiller 100 in a conventional manner so that pressurized fluid is sent from the hydraulic system 110 through the hydraulic hoses 292 to the motor 260. The pressurized fluid activates the motor 260 and the motor 260 rotates the shaft 245. The shaft 245

may rotate in either a clockwise or a counter-clockwise direction as selected by the operator.

[19] The landscape tiller 100 normally needs to be substantially balanced. In the present embodiment, this is accomplished by having the counterweight 297 on the second-side portion 220 of the housing 210 being of substantially the same weight as that of the motor 260 so as to offset the moment arm created by the weight of the motor 260. Additionally, the housing 210 may be formed with the counterweight 297 integral with the first-side portion 215 thereof so as to offset the moment arm created by the weight of the motor 260. Finally, the counterweight 297 may also offset the moment arm created by not only the weight of the motor 260 but the weight of any other element that may be attached to the second-side portion 220 of the housing 210, such as an additional motor, at least one pump, at least one controller, etc., where the weight of the counterweight 297 is substantially similar to the weight of all of the elements attached to the second-side portion 220 of the housing 210. This will permit the landscape tiller 100 to operate in a relatively balanced position.

[20] Other aspects, objects and advantages of the invention could be obtained from a study of the drawings, the disclosure and the appended claims.